NORTH CENTRAL FOREST EXPERIMENT STATION

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MINNESOTA'S ASPEN RESOURCE

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ABSTRACT.—The fourth Minnesota Forest Inventory shows that aspen continues to dominate the State's forests. Thirty-nine percent of Minnesota's commercial forest area is in the aspen forest type. Aspen species accounted for the largest portion of growing-stock inventory, net annual growth, and removals.

KEY WORDS: Forest survey, forest area, timber volume, removals, growth.

The fourth Minnesota Forest Inventory shows that aspen continues to dominate the State's forests. In 1977, the aspen forest type covered 5.3 million acres of commercial forest land—39 percent of the total commercial forest area in Minnesota. Although the total aspen area in the State declined slightly between inventories, the area of aspen in north-central Minnesota increased (table 1).

Farmers own nearly one-quarter of the State's aspen (table 2). County and municipal agencies and miscellaneous private owners hold another large block of the aspen resource.

Most of Minnesota's aspen area is in poletimber stands; only 15 percent of the aspen stands are sawtimber (table 3). Twenty-eight percent of the commercial forest area in other forest types is in sawtimber stands.

Aspen stands are younger, on average, than stands of all other forest types. Seventy-two percent of the aspen forest type acreage is less than 51 years old; only 47 percent of the stands in forest types other than aspen are less than 51 years old (fig. 1).

Table 1.—*Aspen commercial forest area by Forest Survey Unit for 1962 and 1977, Minnesota*
(In thousand acres)

Unit	Aspen area		Percent change
	1962	1977	
Aspen-Birch	2,070.8	1,947.4	–6
Northern Pine	2,360.8	2,541.7	+7
Central Hardwood	640.0	560.2	–12
Prairie	328.2	253.0	–23
All units	5,399.8	5,302.3	–2

Table 2.—*Commercial forest area by ownership class and forest type, Minnesota, 1977*
(In thousand acres)

Ownership class	All types	Aspen type	Other types
National Forest	1,715.1	598.5	1,116.6
Bureau of Land Management	43.9	13.9	30.0
Indian	466.8	187.2	279.6
Miscellaneous Federal	110.5	33.1	77.4
State	2,650.5	846.6	1,803.9
County and municipal	2,341.6	1,057.9	1,283.7
Forest Industry	772.0	315.8	456.2
Farmer	3,403.7	1,278.8	2,124.9
Miscellaneous private	2,191.0	970.5	1,220.5
All owners	13,695.1	5,302.3	8,392.8

Table 3.—*Commercial forest area by stand-size class and forest type, Minnesota, 1977*
(In thousand acres)

Stand-size class	All types	Aspen type	Other types
Sawtimber	3,134.8	791.4	2,343.4
Poletimber	6,956.1	3,032.3	3,923.8
Sapling and seedling	3,434.8	1,478.6	1,956.2
Nonstocked areas	169.4	—	169.4
All classes	13,695.1	5,302.3	8,392.8

Table 4.—*Net volume of aspen by species class and tree class, Minnesota, 1977*
(In thousand cubic feet)

Species class	All live	Growing stock	Cull trees: Short-log	Cull trees: Rough and rotten
Total softwoods	3,682,926	3,477,007	27,060	178,859
Hardwoods:				
Quaking aspen	3,782,905	3,236,405	60,256	486,244
Bigtooth aspen	201,225	174,315	3,398	23,512
Aspen subtotal	3,984,130	3,410,720	63,654	509,756
Other hardwoods	5,178,774	4,566,270	93,743	518,761
Total	9,162,904	7,976,990	157,397	1,028,517
All species	12,845,830	11,453,997	184,457	1,207,376

Aspen volume in Minnesota totaled 4.0 billion cubic feet in 1977. Most of this volume is in growing-stock trees (table 4).

As aspen stands matured, growing-stock volume increased from 2.8 billion cubic feet in 1962 to 3.4 billion cubic feet in 1977. Aspen growing-stock volume per acre increases steadily to age 70, then levels off (fig. 2).

The northern two Forest Survey Units account for 89 percent of the aspen growing-stock volume (fig. 3). Except for Pine County, no county outside the Aspen-Birch and Northern Pine Survey Units has more than 36 million cubic feet of aspen.

Some aspen occurs in all forest types in Minnesota showing that management of other forest types can also yield aspen volumes (table 5).

Although cubic feet of growing-stock is a traditional measure of tree volume, the tree biomass on commercial forest land outside the national forests was estimated during the fourth Minnesota Forest Inventory. Tree biomass gives a more complete measure of volume, because it is the above-ground volume of all live trees from a 1-foot stump, including the bark. Biomass in aspen species totaled 163 million green tons in 1977 (table 6).

Net annual growth of quaking and bigtooth aspen growing-stock totaled 94 million cubic feet in 1976—2.8 percent of total aspen volume. In the aspen forest

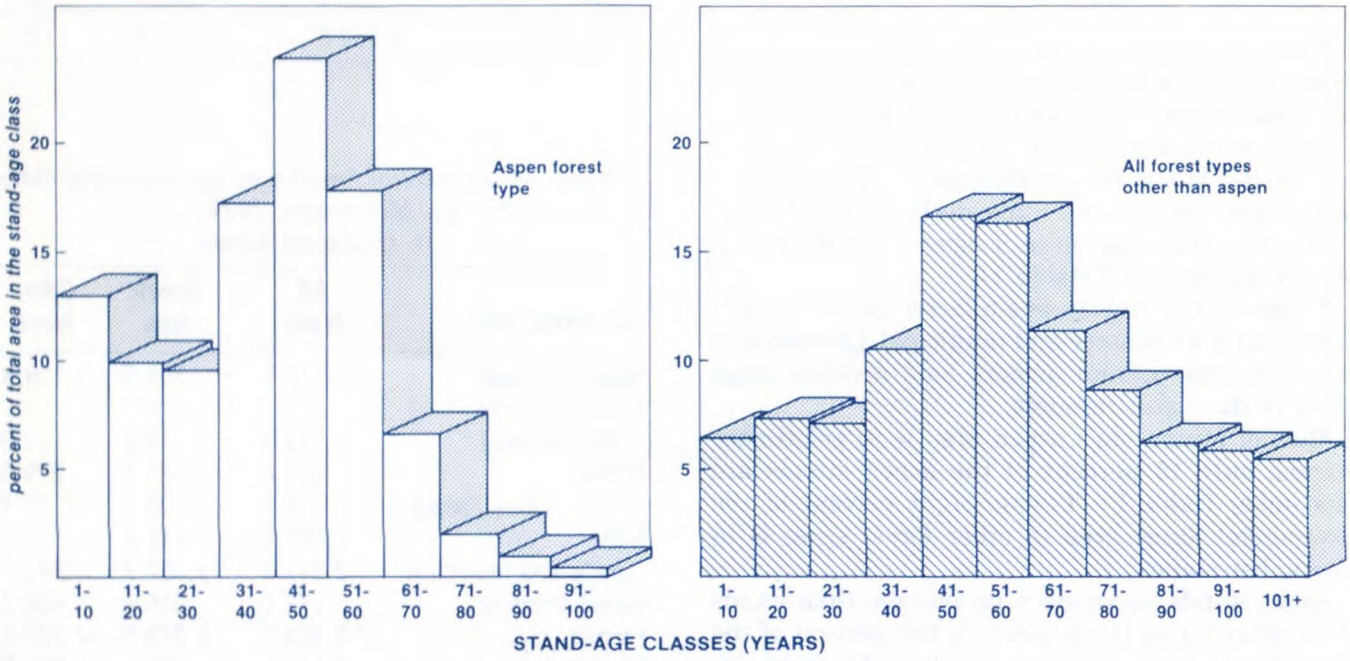

Figure 1.—*Percent distribution of area among stand-age classes, aspen forest type, and all other forest types, Minnesota, 1977.*

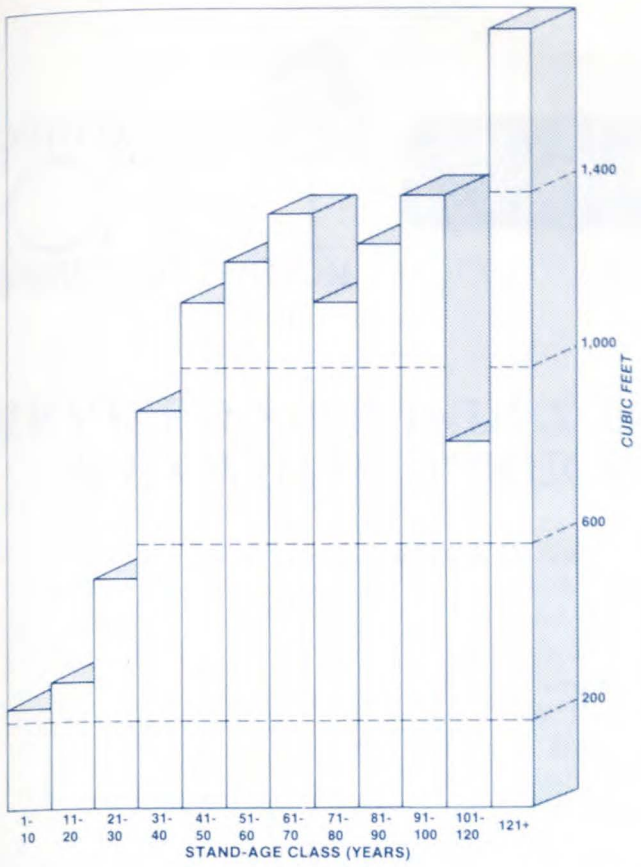

Figure 2.—*Growing-stock volume per acre by stand-age class, aspen forest type, Minnesota, 1977.*

type, growth totaled 153 million cubic feet, an average of 29 cubic feet per acre.

Although aspen growing-stock accounted for 27 percent of the total net annual growth in 1976, it made up 38 percent of growing-stock removals. In 1976, removals from aspen growing stock totaled 73 million cubic feet, up 60 percent from the 46 million cubic feet removed in 1962. More than half the aspen removals (43 million cubic feet) went to pulpwood (table 7). Other removals and logging residue accounted for another 20 percent of the total aspen removals. Other removals are growing-stock trees felled but not used for products, or trees left standing but "removed" from the commercial forest land base by land-use change. Such removals include those resulting from timber stand improvement, land clearing, and other management activities.

Aspen mortality in Minnesota in 1976 was 71 million cubic feet. More than 63 percent of the aspen mortality was caused by disease:

Cause	Aspen mortality *(Thousand cubic feet)*
Insects	612
Disease	45,218
Fire	6,817
Animals	2,259
Weather	10,982
Suppression	—
Unknown and other	5,472
Total	71,360

Table 5.—*Growing-stock volume by forest type and species class, Minnesota, 1977*
(In thousand acres)

Forest type	All species	Softwoods	Hardwoods			
			Total	Other hardwoods	Quaking aspen	Bigtooth aspen
Jack pine	560,341	501,398	58,943	17,256	38,439	3,248
Red pine	379,361	335,285	44,076	26,861	14,328	2,887
White pine	104,078	86,336	17,742	7,562	10,143	37
Balsam fir	679,143	472,151	206,992	128,647	77,556	789
White spruce	49,960	33,121	16,839	9,323	7,516	—
Black spruce	493,495	449,169	44,326	11,689	32,326	311
Northern white-cedar	378,567	329,828	48,739	40,914	7,309	516
Tamarack	203,820	193,989	9,831	7,227	2,604	—
Oak-hickory	784,286	18,768	765,518	701,371	53,146	11,001
Elm-ash-cottonwood	584,282	77,871	506,411	482,904	22,274	1,233
Maple-basswood	1,212,875	82,457	1,130,418	1,035,227	85,594	9,597
Aspen	4,681,925	655,248	4,026,677	1,193,037	2,697,885	135,755
Paper birch	919,682	173,502	746,180	613,448	124,144	8,588
Balsam poplar	407,592	60,344	347,248	287,428	59,467	353
Nonstocked	14,590	7,540	7,050	3,376	3,674	—
All types	11,453,997	3,477,007	7,976,990	4,566,270	3,236,405	174,315

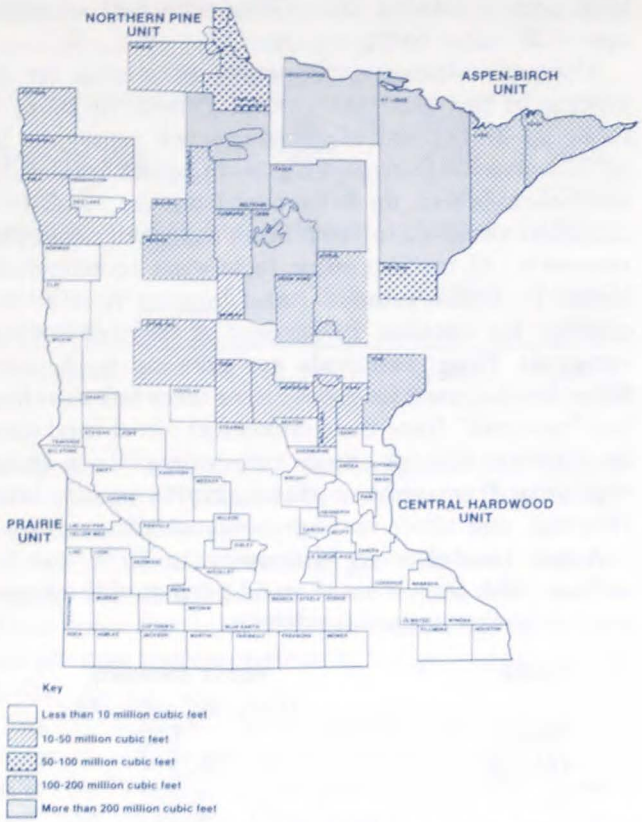

Figure 3.—*Aspen growing-stock volume by county, Minnesota, 1977.*

Table 6.—*Aspen biomass by biomass component and Forest Survey Unit, Minnesota, 1977*
(In thousand green tons)

Biomass component	All units	Aspen-Birch	Northern Pine	Central Hardwood	Prairie
Growing-stock boles	74,159.9	25,271.0	38,880.0	7,445.3	2,563.6
Growing-stock tops and limbs	37,197.0	12,336.2	19,674.3	3,827.6	1,358.9
Cull tree boles	15,867.1	4,255.9	9,095.8	1,733.1	782.3
Cull tree tops and limbs	11,982.7	3,344.9	6,679.6	1,310.3	647.9
1-5-inch trees	23,467.2	8,548.8	10,688.1	2,562.7	1,667.6
All components	162,673.9	53,756.8	85,017.8	16,879.0	7,020.3

Table 7.—*Timber removals from growing-stock by item and species class, Minnesota, 1976*
(In thousand cubic feet)

Item	All species	Total softwoods	Hardwoods		
			Total	Other	Aspen
Pulpwood	89,880	43,165	46,715	4,090	42,625
Saw logs	27,498	10,932	16,566	7,560	9,006
Fuelwood	9,065	511	8,554	6,850	1,704
Posts	1,799	1,544	255	235	20
Veneer logs	460	—	460	395	65
Poles	610	610	—	—	—
Other products	5,723	188	5,535	928	4,607
Logging residue	5,060	1,157	3,903	1,619	2,284
Other removals	53,505	10,693	42,812	30,144	12,668
All items	193,600	68,800	124,800	51,821	72,979

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